Hybrid Surgical Ablation in South America: Lesson Learned

Joao R. Breda
DISCLOSURES

• NONE
How to treat Atrial Fibrillation (AF)

- Understanding of pathophysiology mechanisms
- Ablation approach
- Choice of lesion set
- Choice of energy source
- Interaction between EP and Cardiac Surgeon
Catheter Ablation in Long-Standing AF

Catheter Ablation of Long-Standing Persistent Atrial Fibrillation
5-Year Outcomes of the Hamburg Sequential Ablation Strategy

Roland Richard Tils, MD, Andreas Fillig, MD, Anna-Maria Than, Arta Aya, MD, Peter Wehntoth, Andreas Mohr, MD, Sibiu Matho, MD, Yoshino Yoshio, MD, Burk Wiemer, MD, Kai-Hans Kack, MD, Fatma Geyang, MD
Hamburg, Germany

Objectives
This study describes the 5-year efficacy of catheter ablation for long-standing persistent atrial fibrillation (LAf). Long-term outcome data after catheter ablation for LAf are limited.

Background
Long-term follow-up (35 months, range 49 to 67 months) was performed in 202 patients (age 61 ± 9 years) who underwent the sequential ablation strategy for symptoms of LAf. In this ablation strategy, catheter ablation was performed in interventions (32M). Additional ablation was performed only in severe PM nonresponders, if direct current cardioversion failed after DVI.

Methods
After the first ablation procedure, atrial rhythm was documented in all of 202 (100.0%) patients at multiple procedures, with atrial rhythm maintained in 98 of 202 (48.3%) patients, including 24 patients reaching non-atrial fibrillation. In 102 patients, PM was the sole ablative therapy, 98 (96.1%) of these patients remained in sinus rhythm during follow-up. Patients with a total AF duration <2 years had a significantly higher ablation success rate than patients with >2 years of AF duration (76.9% vs. 42.2%, respectively; p = 0.033). Persistent AF duration (hazard ratio: 1.00; 95% confidence interval: 1.00 to 1.01; p = 0.04); independent of procedural history and whether PM or radiofrequency was added to the ablation procedure; this was the strongest predictor of AF recurrence. A total of 66 patients had a reduced risk of relapse (hazard ratio: 0.67; 95% confidence interval: 0.46 to 0.97; p = 0.029) after the first ablation.

Results
During 5-year follow-up, single- and multiple-ablation procedures success rate of 30% and 45%, respectively. In patients with a total AF duration of <2 years, the outcomes were favorable. [J Am Coll Cardiol 2012; 60(1):92-9] © 2012 by the American College of Cardiology Foundation

Figure 3 Single and Multiple Procedure Outcomes

High-Minear curve over the survival curve after the first procedure (thin line) and after the last procedure (red line). Plus sign (+) indicates censored. Numbers at bottom indicate patients at risk. LAf = atrial fibrillation.
Minimally Invasive Ablation of AF

• Connecting lesions

• Line to the mitral annulus

• Isolation of the coronary sinus

• Lesions in the right atrial
HYBRID SURGICAL ABLATION

- Hybrid ablation procedures consist of epicardial surgical ablation combined with percutaneous endocardial ablation

- The hybrid ablation can be a part of single joint procedure or two preplanned ablation procedures (by no more than 6 months)

- The indication must be evaluated in the context of safety and efficacy
The Hybrid Ablation Procedure

Epicardial approach
• Pro
  - Minimal invasive
  - Fast procedure
  - Exclusion LAA
• Con
  - Transmurality
  - Limited lesion set
  - Limited endpoints

Endocardial approach
• Pro
  - Mapping
  - Electrophysiological endpoints
  - Collaboration with EP
• Con
  - Long procedures
  - Injury phrenic nerve/esophagus
  - Fluoroscopy

STS/EACTS Latin America Cardiovascular Surgery Conference 2017
The Hybrid Ablation Procedure - Techniques

• Bilateral PVI with left atrial appendage (LAA) management (bilateral thoracoscopy or thoracothomy approach)

• Unilateral thoracoscopic PVI posterior encircling box lesion without LAA management

• Alternative approaches to posterior left wall epicardial ablation (“convergent procedure) without LAA management
Hybrid thoracoscopic and transvenous catheter ablation of atrial fibrillation

Sandro Gelsomino\textsuperscript{a,*}, Henrica N.A.M. Van Breugel\textsuperscript{b}, Laurant Pison\textsuperscript{a}, Orlando Parise\textsuperscript{a}, Hanry J.G.M. Crijns\textsuperscript{a}, Francis Wellens\textsuperscript{a}, Jos G. Maessen\textsuperscript{a} and Mark La Meir\textsuperscript{b}

- Minimally Invasive Hybrid Approach 335 patients
- Long Standing Persistent AF 162 patients

Table 1: Baseline characteristics

<table>
<thead>
<tr>
<th>First author</th>
<th>Year</th>
<th>Patients</th>
<th>Age (years)</th>
<th>AF duration (years)</th>
<th>LA diameter (mm)</th>
<th>PCA</th>
<th>PX</th>
<th>PR</th>
<th>LSP</th>
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<td>2011</td>
<td>15</td>
<td>59.5 ± 2.4</td>
<td>5.4 ± 0.6</td>
<td>52.3 ± 10.3</td>
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<td>Krul et al. [18]</td>
<td>2011</td>
<td>26</td>
<td>57 (38–77)</td>
<td>8 (6–25)</td>
<td>47.0 ± 7.0</td>
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<td>La Meir et al. [19]</td>
<td>2012</td>
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<td>57.1 ± 9.5</td>
<td>5 (4–9)</td>
<td>52.0 ± 5.0</td>
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<td>16</td>
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<td>Pison et al. [20]</td>
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<td>26</td>
<td>56.8 ± 8.6</td>
<td>67.2 (47–76)</td>
<td>43.1 ± 5.5</td>
<td>14</td>
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<tr>
<td>La Meir et al. [21]</td>
<td>2012</td>
<td>19</td>
<td>61.2 ± 8.6</td>
<td>5 (3–8.5)</td>
<td>49 ± 20</td>
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<td>3.5 (2.5)</td>
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<td>Muneretto et al. [23]</td>
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<td>36</td>
<td>62.3 ± 10</td>
<td>72.8 (7–240)</td>
<td>50.3 ± 5.5</td>
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<td>-</td>
<td>8</td>
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<td>Gebu et al. [24]</td>
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<td>101</td>
<td>62.9 ± 9.6</td>
<td>5.9 ± 5.5</td>
<td>51 ± 10</td>
<td>36</td>
<td>17</td>
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<td>Bisleri et al. [25]</td>
<td>2013</td>
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<td>62.3 ± 9.8</td>
<td>83.8 ± 69.1</td>
<td>51.3 ± 9.7</td>
<td>-</td>
<td>-</td>
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Studies are presented by the year of publication. Age is expressed as mean ± SD or (range); AF duration expressed as mean ± SD or (range) or median (interquartile range).

y years; m months; LA, left atrial diameter expressed as mean ± SD; PCA, (previous) percutaneous catheter ablation; PX, paroxysmal atrial fibrillation; PR, persistent atrial fibrillation; LSP, long-standing persistent atrial fibrillation.
Hybrid thoracoscopic and transvenous catheter ablation of atrial fibrillation

Sandro Gelsomino, Henrica N.A.M. Van Breugel, Laurant Pison, Orlando Parise, Harry J.G.M. Crijns, Francis Wellens, Jos G. Maessen and Mark La Meir

- Energy source: RF Monopolar and Bipolar

<table>
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<th>First author</th>
<th>Source</th>
<th>Method</th>
<th>Access</th>
<th>Roof line</th>
<th>Inferior line</th>
<th>A-LA</th>
<th>IL</th>
<th>RA</th>
<th>LAA</th>
<th>GP</th>
<th>CTL</th>
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<td>RE (b)I</td>
<td>VATS</td>
<td>B-Thor</td>
<td>Y</td>
<td>-</td>
<td>Y</td>
<td>-</td>
<td></td>
<td>14/15</td>
<td>Y</td>
<td>Y</td>
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<td>RE (b)I</td>
<td>VATS</td>
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<td>23/35</td>
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<td>22/26</td>
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<td>VATS</td>
<td>LAP</td>
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<td>-</td>
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<td>VATS</td>
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<td>Y</td>
<td>Y</td>
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<td>Y</td>
<td>-</td>
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Studies are presented by the year of publication.
RF: radiofrequency; b: bipolar; u: unipolar; I: irrigated; VATS: video-assisted thoracoscopic surgery; VALS: video-assisted laparoscopy; R-Thor: right thoracotomy; B-Thor: bilateral thoracotomy; LAP: laparoscopy; SubX: subxiphoid. A-LA: additional left atrial lines; IL: isthmus line; RA: right atrial and caval lines; LAA: left atrial appendage excision/closure; GP: ganglioneurotic plexus ablation; CTL: cavotricuspid line; CSL: coronary sinus line; Y: yes, ns: not specified.
Hybrid thoracoscopic and transvenous catheter ablation of atrial fibrillation

Sandro Gelsomino, Henrica N.A.M. Van Breugel, Laurant Pison, Orlando Parise, Henry J.G.M. Crijns, Francis Wellens, Jos G. Maessen and Mark La Meir

- Freedom from AF: 85.7% to 92% with Bipolar RF and 36.8% to 88.9% with Monopolar RF

Table 4. Results according to HRS/EHRA/ECAS consensus*

<table>
<thead>
<tr>
<th>First author</th>
<th>All</th>
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<td>n</td>
<td>AF</td>
<td>AF-AAD (%)</td>
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<td>93.3%</td>
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<td>La Meir et al. [19]</td>
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<td>ns</td>
<td>85.7</td>
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<td>Pison et al. [20]</td>
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<td>92</td>
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<td>72.2%</td>
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<td>8</td>
<td>91.6%</td>
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<td>60.7</td>
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<td>88.9</td>
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Studies are presented by the year of publication.
HRS: heart rhythm society; EHRA: European Heart Rhythm Association; ECAS: European Cardiac Arrhythmia Society; AF: (patients free of) atrial fibrillation; AF-AAD: (patients free of) atrial fibrillation and antiarrhythmics; ns: not specified.
*Freedom from AF-off antiarrhythmic drugs (ADD) at 6 months (see text).
Hybrid thoracoscopic and transvenous catheter ablation of atrial fibrillation

Sandro Gelsomino*, Henrica N.A.M. Van Breugel†, Laurant Pison‡, Orlando Parise§, Hanry J.G.M. Crijns¶, Francis Wellens‖, Jos G. Maessen and Mark La Meir

- Mortality 0.8%, Complications Rate 4.1%, Conversion to Sternotomy 0.8%, Tromboembolic Events 0%

Table 5. Early and late outcomes

<table>
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<tr>
<th>First author</th>
<th>Early death</th>
<th>Conversion *</th>
<th>Complications</th>
<th>Late death</th>
<th>Repeated ablation</th>
<th>ECV</th>
<th>TEs</th>
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</tbody>
</table>

Studies are presented by the year of publication.
ECV: electric cardioversion; TE: thromboembolic event; T: tamponade; B: bleeding; HeTX: haemothorax; PNX: pneumothorax; PN: pneumonia; PLE: pleural effusion; B: bleeding.

*Conversion to sternotomy and cardiopulmonary bypass.
Surgical and hybrid atrial fibrillation ablation procedures

Laurent Pison¹*, Nikolaos Dagres², Thorsten Lewalter³, Alessandro Proclemer⁴,
Germanas Marinskiš⁵, and Carina Blomström-Lundqvist⁶, conducted by the
Scientific Initiative Committee, European Heart Rhythm Association

Why would a cardiologist or EP refer a patient with lone AF for a surgical approach?

- 30% failed catheter ablation
- 24% longstanding persistent AF
- 15% wish to exclude LAA
- 16% preference of the patient
- 12% shorter waiting list
Operative Technique

• Small bilateral thoracotomies (8-10cm)

• More lateral is preferred, especially on left side

• Right side 4th interspace

• Left side 3rd interspace
Operative Technique - Rationale

- Minimally invasive operations should not sacrifice efficacy for cosmetics
- Use established principles of surgery and electrophysiology
  - Most effective lesion patterns for ablation
  - Identification and destruction of autonomic ganglia
  - Intraoperative confirmation of arrhythmia control
- Development and adaptation of technology to perform truly effective, minimally invasive surgery
Research Question 5: What are the indications for a hybrid ablation or stand-alone off-pump epicardial ablation in patients with AF?

Recommendation #7. Overall, hybrid procedures have shown promising results compared with percutaneous catheter ablation in a subgroup of symptomatic patients with AF in whom medical treatment or percutaneous catheter ablation have failed.

Class IIb: Hybrid procedures may be considered as a stand-alone procedure in patients with appropriate indications and by an experienced heart team.

Level of Evidence: Level B-NR
CONCLUSIONS

• AF is a serious condition

• Surgical ablation is a safe and effective strategy

• Bipolar RF or Cryoprobes are the best ablation devices

• It is important to carefully consider the indications for hybrid procedures

• Training protocols need to be create to ensure patient safety and beneficial outcomes
CONCLUSIONS

• Multicenter randomized trials

• It is necessary to establish whether hybrid procedures may become a standard treatment for lone AF

• Determine solid endpoints to improve the long term success rate

• Reduce complications

• Single procedures will lead to a higher cost efficacy